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METHOD AND APPARATUS FOR A VIRTUAL DISPLAY/KEYBOARD FOR A PDA

FIELD OF THE INVENTION

The present invention relates generally to the field of personal digital assistants (PDA's) and more particularly to keyboards for PDA's. In particular, this invention provides a space saving virtual display/keyboard for a PDA.

BACKGROUND OF THE INVENTION

Personal digital assistants (PDA's), such as the Apple Newton or the Palm PILOT, have become very useful devices for carrying personal notes, calendars, appointments, phone numbers, 'to do' lists, etc. PDA's are hand held personal computers that help to manage personal information. It would be desirable for PDA's to be as small as possible, such as the size of a credit card, so that they could be carried in a wallet, purse, pocket, brief case, etc. Two of the main limiting factors to the size of PDA's is the requirement for a reasonable quality display and some means for user input, such as a keyboard or area for pen input. To date there has been a tremendous tug-of-war between the desirable small size for portability and the larger size necessary for user input. Accordingly, it would be desirable for a PDA to be relatively small for portability, yet also have a reasonably sized display and user input area.

SUMMARY OF THE INVENTION

The above and other aspects of the present invention are accomplished in a personal digital assistant (PDA) having a virtual display/keyboard. In the PDA according to the present invention, the PDA uses a projection display to create a virtual screen and a projection "finger sensor" to create a virtual keyboard on any flat, light colored surface.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will be to better understood by reading the following more particular description of the invention, presented in conjunction with the following drawings, wherein:

FIG. 1 illustrates a top view of a virtual display/keyboard for a PDA according to the present invention;

FIG. 2 illustrates a side view of a virtual display/keyboard for a PDA according to the present invention; and

FIG. 3 illustrates a top view of a virtual display/keyboard for a PDA having projection lasers and sensors for determining finger stroke positioning according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a top view of a PDA 100 projecting a virtual display 104 and a virtual keyboard 108 onto a flat, light colored surface 102. The projection surface 102 would preferably be a substantially white surface, such as a sheet of paper. Also, the virtual keys on the virtual keyboard 108 need not be, but may preferably be in a staggered pattern to allow for laser sensor pick-up, as shown in FIG. 2. The projection 106 may be accomplished by means of one of several projection technologies. One example would be the Texas Instruments Digital Micro mirror Display (DMD).

FIG. 2 shows a side view of PDA 100 with projection 206 being emitted from a top edge 208 of the PDA card 100 onto

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a substantially flat, light colored surface 200, such as a white sheet of paper. Finger sensing of virtual keyboard keys 108 is accomplished by means of laser beams 202 emitted from a bottom edge 204 of PDA card 100 just above the surface of the flat, light colored surface 200. Accordingly, each laser 302 and 306 would sense when a finger or pen 300 had broken the laser beam 202 by sensing the reflection from the finger 300 of the returned laser light to a sensor device 304 and 308, such as a CCD array, see FIG. 3. Measuring the laser angle α and β for each of two lasers 302 and 306 to the finger 300 would identify the exact key location 108. This allows the PDA 100 to sense that the user had "touched" a key 108, either as a keystroke or a pointing action.

In operation, any data that would normally be displayed on a notebook screen or computer CRT will be projected onto the flat, light colored surface 200 by means of, for example a Digital Micro mirror Display 101 (positioned inside the PDA 100 as shown in FIG. 2). Also, virtual keys of a keyboard 108 will be projected on to the light colored surface 200 in a staggered fashion, such that when the user touched or points to a particular key, laser sensors 204 at the bottom edge of the PDA card 100 will detect which key is being indicated and the PDA 100 will accept the input as if a key on an actual keyboard had been depressed. Also, as the application of the PDA changes from, for example, a calendar to an address book or to a personal notebook, the functions of the various keys on the virtual keyboard may change to correspond to the associated application of the PDA 100. It should also be noted that the PDA projects a virtual display screen 104 and virtual keyboard 108 that is substantially larger than the area of the PDA. This is how the dual goals of a small PDA size for Portability and a large display/user input area is accomplished—by projecting a much larger display/keyboard from a small PDA card.

The foregoing description of the present invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and other modifications and variations may be possible in light of the above teachings. For example, the present invention may also be utilized in personal notebooks, personal computers, recreational computer games or in any similar situation where there is a need to conserve the space typically utilized for the computer display and user input/keyboard for the purposes of portability or changing desk top configurations, etc. The embodiment was chosen and described in order to best explain the principles of the invention and its practical application to thereby enable others skilled in the art to best utilize the invention in various embodiments and various modifications as are suited to the particular use contemplated. It is intended that the appended claims be construed to include other alternative embodiments of the invention except insofar as limited by the prior art.

What is claimed is:

1. A display/keyboard of a hand-held personal digital assistant comprising:

a virtual display projected from said personal digital assistant by means of a Digital Micro mirror Display positioned within said personal digital assistant onto a substantially flat, light colored surface located remotely from said personal digital assistant;

a virtual keyboard projected from said personal digital assistant by means of a Digital Micro mirror Display positioned within said personal digital assistant onto said substantially flat, light colored surface, whereby said virtual display and said virtual keyboard comprise an area which is larger than the area of any surface on said personal digital assistant; and